



CBCT INVESTIGATION OF THE INTRABONY CANAL COMMUNICATIONS BETWEEN THE VESTIBULAR AND LINGUAL PLATES IN THE ANTERIOR MANDIBLE

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ABSTRACT

Purpose: To assess the presence of the vestibulo - lingual intrabony canal communications (VLC) in the anterior mandible using cone beam computed tomography (CBCT).

Materials and methods: Study material included 200 CBCT scans taken for preoperative planning of implant placement. The images were examined carefully by three observers concerning the presence of VLC. Inter-observer agreement in identification of the canal communications was excellent (mean kappa value – 0.82).

Results: Vestibulo - lingual communications were found in 27 % of cases. The communications appeared as a crossing of the lateral lingual canal with the mandibular incisive canal (type 1), as a connection between mid-line lingual canal (or canals) and a vestibular nutrient canal (type 2) or as a lateral lingual canal connected with the anterior loop of the mandibular canal (type 3).

The main type of VLC is those between a lateral lingual canal and mandibular incisive canal – 85.2% from all of the VLCs.

Conclusions: A considerable part (27%) of Bulgarian citizens has vestibulo - lingual communications in the anterior mandible. The type 1 communication prevails, and it is more frequently located on the right side.

The knowledge about vestibulo - lingual communications could contribute a better understanding of bone tumor invasion but further studies are necessary.

Keywords: cone beam computed tomography, lingual canal, oncology, mandible,

INTRODUCTION

The small accessory canals are frequently observed in the region of the mental spines and the premolar regions on the lingual surface of the mandible, and they are called respectively medial and lateral lingual canals.

It is well known that on the vestibular aspect of the mandible are located the openings of both mandibular ca-

nals (mental foramina) and also a nutrient canals (buccal foramina) containing branches from the submental, facial (lower labial) or buccal arteries [1-5].

The floor of the oral cavity is one of the sites frequently affected by tumors.

The lower jaw bony canals and the communications between them are a potential pathway for tumor invasion of neoplastic processes located in the neighbor soft tissues [6-11].

The intrabony vascular canals can also be a way for spreading of the inflammatory processes [7].

The accessory canals in the lower jaw may reach a diameter at about 2 mm and therefore can cause profound bleeding during surgery during a flap elevating [12].

The accessory canals and their communications can be investigated with multislice computed tomography (MSCT) and magnetic resonance imaging (MRI) [5, 11, 13-16].

Cone beam computed tomography (CBCT) can also be used for this purpose due to its high resolution (up to 0.08 mm) and the significantly lower dose in comparison with MSCT [2, 12, 17].

Despite the large variations of the effective dose ranging between 19 - 368 μ Sv, CBCT has significantly lower dose than the standard MSC [18, 19].

There are not enough CBCT studies for vestibulo - lingual bony canal communications in the anterior mandible and there is no published study involving cases from the Bulgarian population.

MATERIALS AND METHODS

This retrospective study sample consists of 200 CBCT scans done prior dental implant treatment.

The CBCT examinations were performed with a Planmeca Promax 3D Mid (Planmeca Oy, Helsinki, Finland).

All patients had given their informed consent for this examination.

The study protocol was carried out in accordance with the principles described in the Declaration of Helsinki, including all amendments and revisions.

Only the investigators had access to the collected data.

The selected scans were performed at 84 kVp and 4 mA with a 16×16 cm FOV at voxel size 0.4 mm.

The vestibulo - lingual communications were analyzed with Planmeca Romexis viewer (v. 4.6.0. R), using axial slice, cross-sections of the mandible and a slice on a panoramic curve.

The images were examined carefully about the presence of intrabony VLCs by three observers.

Agreement between observers was reached by means of a majority decision (at least two observers with the same opinion).

For the purpose of this study, the canal communications were distributed in three types using a modified classification of Trikeriotis et al. [11].

The canal communications between lateral lingual canal (LLC) and the ipsilateral mandibular incisive canal (MIC) and respectively with MC were classified as type 1.

Type 2 canal communications were those cases when a medial lingual canal communicates with a vestibular nutrient canal (VC).

The canal communications between the lateral lingual canal and anterior loop of the mandibular canal were classified as type 3.

All data were gathered and statistically analyzed by SPSS 16.0 (SPSS Inc., Chicago, Illinois, USA).

Kappa statistics were applied for assessment of the interobserver agreement.

In the statistical processing, descriptive analysis and the chi-square test was also used.

P-values of 0.05 or less were considered statistically significant.

RESULTS

Vestibulo - lingual communications were found in 27% (n = 54) of cases (n = 200).

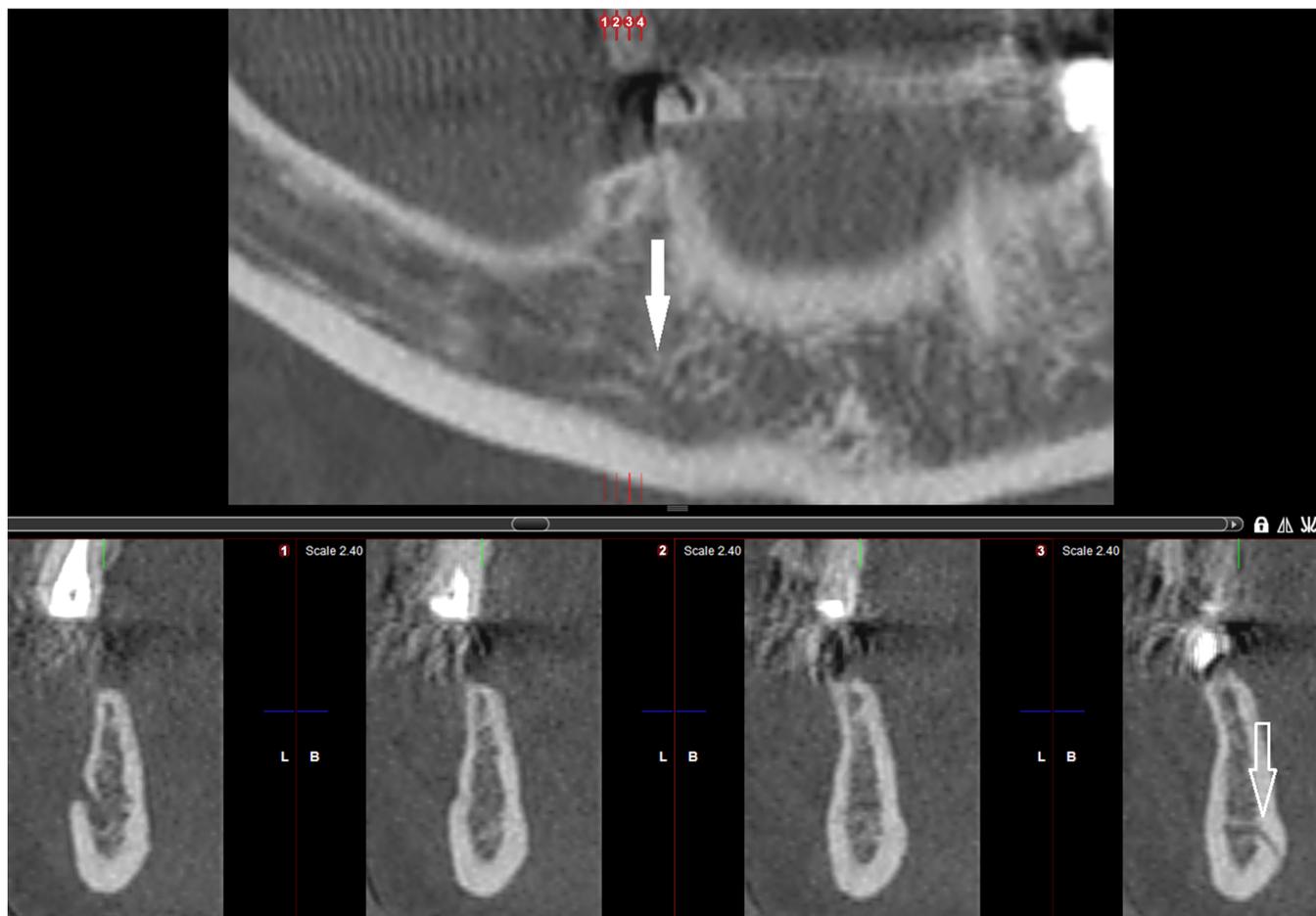
In all of the cases, we found only one VLC, except two patients, where there were two VLCs - type 1 and type 2 and type 1 and type 3, respectively.

Interobserver agreement in identification of the canal communications was excellent (mean kappa value – 0.82).

In 23% (n = 46) of the patient type 1 canal communication was found (Fig. 1).

This type of canal communication comprises 85.2% of all our cases (n = 54) with vestibulo - lingual communications.

Fig. 1. Patient with vestibulo - lingual communication type 1: LLC (empty arrow) connected with the right MIC (arrow).



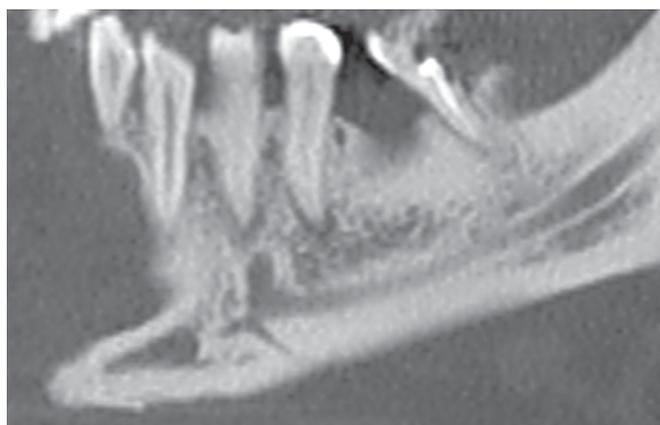
In 2% (n = 4) of the patients, type 2 communications were found (Figure 2).

Fig. 2. Patient with vestibulo - lingual communication type 2: two medial lingual canals communicating with a vestibular nutrient canal.



In 3% (n = 6) of all patients, a direct communication between LLC and the anterior loop of the mandibular canal (type 3) was found (Figure 3).

Fig. 3. Parasagittal slice presenting vestibulo - lingual communication between LLC and the anterior loop of the left mandibular canal (type 3 communication).



The type 1 communications comprise 23% (n = 46) from all examined patients.

Bilateral localization was found in 3% (n = 6) and unilateral localization for the right and left mandible was found in 13.5% (n = 27) and 6.5% (n = 13) respectively.

There was a significant difference between the fre-

quency of VLC type 1 in the left mandible compared to the right half of the mandible (χ^2 , $t = 2.09$, $p < 0.05$).

There was no difference regarding the frequency of VLC type 1 communication between both genders - 23% (n = 23) for each of them.

In 2% (n = 4) of all cases, communication in the midline region of the mandible (type 2) was found (Figure 2).

In 3% (n = 6) of the cases VLC communication (type 3) was established (Figure 3).

DISCUSSION

The information about intrabony canals in the anterior mandible and their vestibulo - lingual communications may be useful for a better understanding of tumor invasion and the spreading of the inflammatory processes.

The mapping of these canals and their communications can be also used to determine a safe zone for implant placement and bone harvesting in order to avoid neurosensory disturbances and haemorrhages [20].

The occurrence of patients with VLC in this CBCT study (27%, n = 54) is very close to the results of Trikeriotis et al. reporting frequency of 28% of the observed with CT cases [11].

The occurrence of type 1 VLCs in our investigation (85.7 %) coincides with the data of their study [11].

Trikeriotis et al. didn't find a difference between the frequency of type 1 VLC in both halves of the mandible [11]. In our group of patients, type 1 VLC was found more frequently on the right side ($p < 0.05$).

The results of our study didn't show a gender preponderance regarding type 1 VLC occurrence and didn't coincide with other authors reporting that the occurrence is more frequent in the males [11].

Type 2 VLC cases were 2 % in our study and this is close to the results of Trikeriotis et al. reported 4 % [11].

In 3 % (n=6) of the cases, we found type 3 VLC. This type of communication at best our knowledge is not described in the literature, and it can also be a possible way for the spread of neoplastic and inflammatory diseases.

The present study confirms the existence of VLC communications and demonstrates the possibility to be investigated by CBCT.

CONCLUSION

A considerable part (27%) of Bulgarian citizens has vestibulo - lingual communications in the anterior mandible.

In our study, the type 1 communication prevails (85.2%) and it is more frequently located on the right side.

Communications type 2 and type 3 rarely occur (2% and 3% respectively), but also should be considered as an eventual pathway for perineuronal tumor spread.

The knowledge about vestibulo - lingual communications could contribute a better understanding of bone tumor invasion but further studies are necessary.

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